Effect of Arbuscular Mycorrhizal Fungi Application on Welsh Onion Growth and Yield

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Arbuscular mycorrhizal fungi are expected to reduce the need for phosphate fertilizers. Our previous study on the effects of arbuscular mycorrhizal fungi inoculation on soybean and Welsh onion (Allium fistulosum L. 'Motokura') showed that there were no growth promoting effects of the inoculation on soybean in the field; however, the inoculation increased Welsh onion growth and yield. Therefore, in the present study, we conducted further field inoculation experiments in Welsh onion. Welsh onion was sown with the inoculum R10 (Idemitsu Kosan Co., Japan) in nursery beds without indigenous arbuscular mycorrhizal fungi. Phosphate fertilizer was used only in the non-inoculated nursery beds. Six-week-old seedlings were transplanted to fields and cultivated for 4 months. We used two fields located in Kyoto and Shiga, in Japan. Soil textures in both fields are Andosols. In the field, the test plants were grown using an experimental design with two treatments (inoculation and non-inoculation) and two phosphate fertilizer levels (0 and 20 kg per 10a) with 4 repetitions (blocks).

The inoculated seedlings showed poor growth before transplantation because of the lack of phosphate fertilizer. However, after transplantation, in the Kyoto field, the inoculated seedlings showed rapid growth and their fresh weight was higher than that of the non-inoculated seedlings on the 35th day of transplantation and at the time of harvest under the lower phosphate fertilization level. In the Shiga field, the difference in seedling growth tended to decrease as cultivation progressed, but the yield did not differ between the inoculation and non-inoculation treatments under either fertilization level.

These results suggest that arbuscular mycorrhizal fungi inoculation improves the growth of Welsh onion under field conditions. However, some issues hinder the practical application of arbuscular mycorrhizal fungi inoculation in the field. For example, the optimal method for inoculation in nursery beds, which would allow for mechanical transplantation of seedlings, needs to be determined.

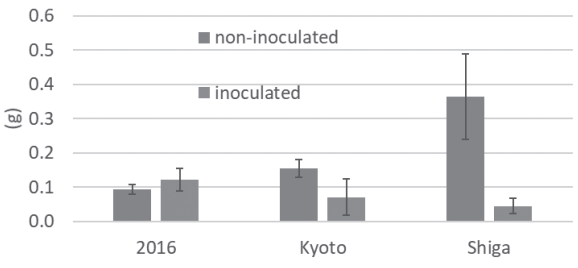

Fig.1 fresh weight of seedling at 6weeks

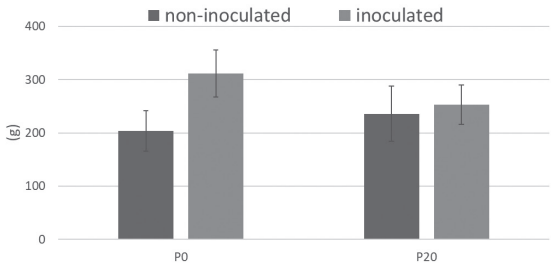

Fig.2 Fresh weight of shoots(25weeks after transplanting) in Kyoto field

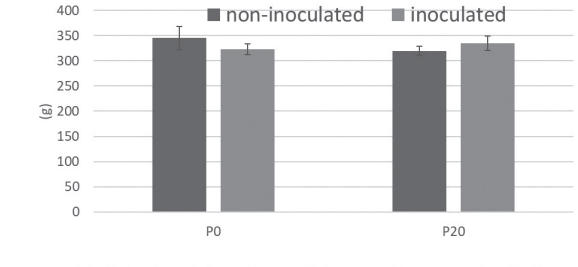

Fig.3 Fresh weight of shoots(26weeks after transplanting) in Shiga field